

# HORTUS EXOTICUS

Beiträge zur Freilandkultur Winterharter Exoten in Mitteleuropa



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Alle Winterhärtezonen im Hortus Exoticus beziehen sich auf die mittleren langjährigen Temperaturminima, nach Heinze und Schreiber (1984), siehe auch Hortus Exot. 2006/2: 33–34.

Zone 6a: –23,3 bis –20,6 °C

Zone 6b: –20,5 bis –17,8 °C

Zone 7a: –17,7 bis –15,0 °C

Zone 7b: –14,9 bis –12,3 °C

Zone 8a: –12,2 bis –9,5 °C

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Umschlagphoto: Blütenstand von *Sabal minor* (Jacq.) Pers., Mike J. Papay / Sergio Quercellini

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## Behavior patterns of some palm species belonging to the genus *Trachycarpus* Wendl.

By Sergio Quercellini

Abstract: After a list of the species belonging to the genus *Trachycarpus* Wendl., the behaviors of some species are described over all with reference to the flower biology and to the fruits. - With ten figures.

Keywords: Corypheae - palm behavior - *Trachycarpus*

The genus *Trachycarpus* Wendl. comprises eight to ten species. This range depends on the opinion of some authors who consider two of the ten species as subspecies or synonyms. All species of this genus can be divided into two groups on base of the seed shape.

Kidney shaped seed species:

*Trachycarpus fortunei* (Hook.) Wendl., *T. geminisectus* Spanner, Gibbons, V. D. Nguyen & T. P. Anh, *T. nanus* Becc., *T. oreophilus* Gibbons & Spanner, *T. princeps* Gibbons, Spanner & San Y. Chen, *T. takil* Becc., *T. ukhrulensis* Lorek & Pradhan, *T. wagnerianus* Becc.

Oval and grooved seed species:

*Trachycarpus latisectus* Spanner, Noltie & Gibbons, *T. martianus* (Wall. Ex Mart.) Wendl. *Trachycarpus latisectus* is considered as a *T. martianus* subspecies by Lorek (2007), while *T. wagnerianus* is not accepted as a species by Govaerts & Dransfield (2005).



Fig. 1 Infructescence of a female *Trachycarpus fortunei*. Remarkable, there is only one ripened true fruit, from one hermaphroditic flower. All the others are pseudo-fruits

The palms of this genus show fan leaves, medium height trunks and are spread in Asia, in particular in Northern and Eastern India, Nepal, Myanmar, Vietnam, South China and Northern Thailand. They grow at remarkable

altitudes ranging from 1300 m up to 2533 m and therefore they are considered cold hardy. All species have aerial trunks except *Trachycarpus nanus* and are single trunked. *Trachycarpus caespitosus*, described by Beccari (1920) as suckering species, is considered a mistake as no suckering *Trachycarpus* specimen has ever been found so far.



Fig. 2 Infructescence of a female *Trachycarpus fortunei*. There is only one true fruit from a hermaphroditic flower. All other fruits from female flowers were dropped

The palms of the genus *Trachycarpus* are dioecious or polygamous (Uhl & Dransfield 1987) but there are no specifications about the single species behavior. The author checked the polygamous character with reference to *T. fortunei*, *T. takil* and *T. wagnerianus*. Beccari was the first botanist who observed the polygamous behavior in a *T. fortunei*. He wrote (1905):

“Sometimes the male palms bear spadices with hermaphroditic flowers that are a little bigger and sparser than the male ones and that have better conformed carpels with an air ring in the middle [...]. I observed a case of hermaphroditism in a plant I am growing. This palm, in May 1887, besides the male spadices, bore some spadices with all hermaphroditic (at least in appearance) flowers and produced also many fruits. The hermaphroditism case did not happen any more in this palm [...]. The hermaphroditic flowers have



the same features as the female ones: the carpels are well developed and have an air ring in the middle that is lacking in the carpels of the male flowers”.

The author observed this particular behavior, as far as it refers to the subtribe Thrinacinae, also in the genus *Chamaerops* L. and *Rhapidophyllum* Wendl. & Drude. Beccari reports (1905) that *Trachycarpus martianus* is only dioecious and, as far as it results, no one has ever reported or described hermaphroditic flowers in a *T. martianus* spadix. There are no reports about *T. latisectus* because the specimens in cultivation in the Western world are too young and then not yet flowering. Adult and flowering *T. latisectus* are cultivated in Northern India (M. Lorek pers. comm.) but, as far as it results, no botanist has ever undertaken a research about the biology of their flowers. Considering the remarkable similarity with *T. martianus*, it is possible to suppose it also could be only dioecious.



Fig. 3 A kidney shaped fruit on the left and a pseudo fruit on the right, both belonging to *Trachycarpus fortunei*

The polygamous behavior refers not only to the male specimens but also to the female ones. In this latter case however it is necessary to specify it better.

The author observed in detail more than once the inflorescences of three female *Trachycarpi fortunei* growing in his garden. There is no other *Trachycarpus* specimen, male or female, in a range of at least five km so that the three female *T. fortunei* palms very probably are not pollinated by the pollen of an outer male *Trachycarpus* specimen. Nevertheless some of their inflorescences carried true fruits (Fig. 1) even if very few. The distance of 5 km might not determine a complete certainty about the lack of an outer pollination. It is however author’s opinion that these few true fruits derive from hermaphroditic flowers. In particular the author observed the following cases:



Fig. 4 *Trachycarpus takil*, allegedly male, in the Rome Botanical Garden



Fig. 5 Female *Trachycarpus martianus* in the Rome Botanical Garden

- If the female specimen bears an inflorescence with only few hermaphroditic flowers in addition to the female ones or this inflorescence bears only female flowers and very few of them have been pollinated by the male pollen, these flowers begin obviously forming true fruits but soon two further subcases can happen:

a) the few true fruits begin enlarging but all the many not pollinated female flowers dry and fall down (Fig. 2). In a short time also the few true fruits dry together with the inflorescence.

b) All not pollinated female flowers do not dry and, on the contrary, they remain on the inflorescence. In this case they develop strangely the three carpels and form the false or pseudo-fruits (Beccari 1905)(Fig. 3). The false fruits develop the three carpels just a little and then stop, remaining alive in the inflorescence until the true fruits are ripen, “saving“ these latter ones. This means that there is an exchange of a substance between the false fruits and the inflorescence and this substance allows the inflorescence to stay alive.



Fig. 6 Spadix of a female *Trachycarpus martianus* with pollinated bigger hybrid fruits and smaller false ones

The factors that cause the case a) instead of the case b) or vice versa are, for the time being, unknown.

- If the greatest number of the flowers in the inflorescence of a female specimen has been pollinated, the false fruits are not formed, the many true fruits are able to keep the inflorescence alive.

The consequence of the polygamous behavior is that the presence of true fruits in the inflorescence of a *Trachycarpus fortunei*, *takil*, *wagnerianus* specimen (probably of all kidney shaped seed species one) is not an evidence for the palm to be a female because the true fruits could derive from hermaphroditic flowers born in the inflorescence of a male specimen. Obviously

the presence of false fruits in the inflorescence means that the specimen is for sure female.

- By Beccari's reports and also by author's observations it derives that, if the male inflorescence bears true fruits from hermaphroditic flowers, these latter ones must be numerous to keep the inflorescence alive otherwise the inflorescence itself dries and the few true fruits die. Beccari refers (1905) to some spadices of a male *fortunei* growing in his garden that were fully laden of true fruits from hermaphroditic flowers. The author observed directly two male *Trachycarpi wagnerianus* each bearing many true fruits in an inflorescence.

The species of the genus *Trachycarpus* show also a further particular behavior with refers to the possible hybridization. Some attempts to hybridize the kidney shaped seed species among themselves have been successful, that is the hybrid seeds proved to be fertile, as *T. nanus* × *wagnerianus* (M. Gibbons pers. comm..) and *T. takil* × *fortunei* (obtained by the author from takil seeds collected in the university La Sapienza, Rome). About this latter crossing it is worth noticing



Fig. 7 Pollinated bigger hybrid fruit of *Trachycarpus martianus* on the left together with a false one on the right. Only two carpels developed in this latter fruit



Fig. 8 A hybrid fruit of *Trachycarpus martianus* has been cut by the author to show the aborted seed



that *T. fortunei*'s eophyll shows four ridges in relief while that of *T. takil* is narrower and longer showing only two ridges. If an eophyll from a *takil*-seed shows three or four ridges, it is author's opinion that very probably the seedling is hybrid.

In the Rome Botanical Garden some specimens of the genus *Trachycarpus* are growing, namely:

- One very old *T. takil* (Fig. 4) that derives from the seed batch shipped from T. F. Duthie to Beccari in 1887. This specimen is believed to be male because neither the author nor botanists of the Garden have ever observed false fruits from its inflorescences. Nevertheless almost every year it bears some fruits from hermaphroditic flowers.
- Seven male and female *T. fortunei* .
- One male *T. wagnerianus*.
- One female *T. martianus* (Fig. 5).

All these specimens are very close to each other and flower regularly so that crossings very easily happen. In particular the author observed that each inflorescence of the female *Trachycarpus martianus* bears every year:

- some pollinated bigger fruits (Fig. 6);
- many not pollinated false fruits (Fig. 6). In the case of *T. martianus* the false fruits have a different shape (Fig. 7) from that of *T. fortunei*, *T. takil* and *T. wagnerianus*. As the female *Trachycarpus martianus* cannot bear hermaphroditic flowers being only dioecious, the bigger fruits are pollinated by the pollen of a male specimen belonging to a kidney shaped seed species as there is no other *T. martianus* specimen in the Botanical Garden. The author observed and checked for three years that the development of the *T. martianus* pollinated fruits stops, never reaching the maturity so that these seeds have proved to be always infertile (Fig. 8).

We can consider that in many cases the hybridizations among species belonging to a single genus give fertile



Fig. 9 *Trachycarpus takil* growing in the author's garden



Fig. 10 Part of the horizontal and subterranean trunk developed by the author's *Trachycarpus takil*. The position of the stick is the starting point

seeds (*Butia* Becc., *Syagrus* Mart., [...]). In the case above the hybridization between an oval and grooved seed species (*Trachycarpus martianus*) and a kidney shaped seed one (*T. fortunei*, *T. takil* or *T. wagnerianus*) both belonging to the same genus *Trachycarpus*, proved to give always infertile seeds. This behavior shows that could there be remarkable genetic differences between the oval and grooved seed species group and the kidney shaped seed species one of the genus *Trachycarpus*.

A further particular behavior refers to the growth of *Trachycarpus takil*. Beccari (1905) reported that all his specimens crept as young plants. The author is growing a *T. takil* deriving from a seed collected just near the base of one of the two *T. takil* in the university La Sapienza of Rome and sowed in 1994 (Fig. 9). This specimen not only crept as a young plant but it moved on the ground resembling a subterranean trunked species of the genus *Syagrus* (*Syagrus vagans* (Bondar) A. D. Hawkes). Its trunk grew slowly and horizontally under the ground during the seedling and partially the young age that is, in the author's case, about 10-12 years (Fig. 10). After this time the *T. takil* began growing straight. This specimen is now growing straight 40 cm far from the position where it was planted as small seedling.

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